SOIL TYPE AND LAND USE, FLINDERS ISLAND

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ABSTRACT

Phases of land settlement and problems of land development are related to the C.S.I.R.O. soil survey of Flinders Island, 1957. The analysis is in terms of property ownership whether private or War Service Land Settlement, type of farming, associated vegetation, and difficulties of land improvement. It is concluded that knowledge of soil type has been essential for the spread of settlement, and that while further development is physically possible it may be precluded by the high costs of land development and the provision of adequate marketing facilities.

INTRODUCTION

Flinders Island, 513 square miles in area, lies in Bass Strait, at approximately 40°S and 148° E; with Cape Barren Island (172 sq. mls.) and Clarke Island (44 sq. mls.), and at least 40 other named small islands it belongs to the Furneaux Group. Owing to its maritime environment, Flinders Island has an equable climate (Koppen's Cfb), a winter rainfall maximum, a warm summer and mild winter. The average annual rainfall ranges from 28 to 31 inches, with possibly up to 34 inches in the Strzelecki Peaks in the southwest; the rainfall variability is 20.75% (from rainfall data for Pats River over 19 years). Strong westerly winds are common and frosts are rare.

PHASES OF SETTLEMENT

Apart from occasional visits by sealers and whalers prior to 1830, and the government settlement for the remnant of the Tasmanian aborigines between 1831-1847, "The Great Island of Furneaux" has seen three main phases of occupation and land development: (1) From 1847 the Island was leased as a whole for grazing, and although opened for selection in 1888, progress was very slow and mainly restricted to the central west coast. The *Crown Lands Guide*, 1885 described Flinders Island as "very rough and rocky, and little adapted for agriculture. The coarse native grass supports a few cattle, and on some of the smaller islands a few sheep are kept". Irregular shipping and lack of roads were further impediments. By 1896, there were 34 property owners on Flinders Island, including nineteen "graziers", nine "farmers" and four "mariners". (Witton, 1896). (2) About 1903 development was initiated in the south east, and in 1911 a boom in land speculation took place, similar to that on King Island (another Tasmanian island in Bass Strait). According to the official guide in 1912, there were " . . . considerable areas of good land in patches of a few hundred acres around the eastern and central portions of the Island . . . These areas consist of open cutting-grass tussock flats or mixed tussock and grass-tree land, having a dark sandy surface soil from 3 to 6 inches deep then 6 to 12 inches of sand, with a clay bottom 1 to 2 feet from the surface. This class of land is partially submerged during the rainy season, and is completely dry for a few months in the Autumn. The value of this land will no doubt be demonstrated during the next year or two by the incoming selectors who have acquired considerable areas of similar country together with the apparently richer lagoon lands."

Despite the optimism reflected here, settlement expanded only slowly, and fencing, clearing and actual utilisation lagged behind selection, particularly because of the capital cost of clearing and draining sufficiently large tracts.

(3) In 1947 a Joint Committee of both Tasmanian Houses of Parliament was appointed to examine communication facilities and the Island's potential for war service land settlement. It was concluded that Flinders Island was "admirably suited" for land settlement purposes, and it was recommended that "immediate steps be taken to provide sufficient farms for applicants desirous of settling on the Island". The phase of slow selection, with the recognition of potential in the east and Nelson's Lagoon area, thus drew to a close with increasing agitation for a share in the Commonwealth Closer Settlement Board's development projects. Phase three commenced with the initiation of land development by the Agricultural Bank of Tasmania in 1952 as part of the Closer Settlement Board's War Service Land Settlement Scheme; private development also occurred but was mainly confined to a small area in the south and south east.

SOILS AND LAND USE

A detailed soil survey of Flinders Island was published by the C.S.I.R.O. in 1957, with soil associations being mapped at a scale of 1:31,680; eleven soil series and one soil complex were differentiated and named. For convenience of reference, data from Table 5 in the C.S.I.R.O. Report (Dimmock, 1957) are retabulated here as Appendix I, with further comments on land use or cover, and location. Dimmock concluded, in summary, that: "The soils of the mountains [up to 2,500 ft.] and foothills are skeletal and residual soils, some highly leached and very old, on granite and quartzite. On the east and south coastal plain, there are deep acid sands (podzols and ground-water podzols), deep slightly calcareous sands with weak profile development, highly organic soils, shallow calcareous soils, and minor extents of clayey soils. The west coastal plain soils are mainly podzolic on

granitic detrital material, with some deep siliceous sands. The calcareous dunes are of two ages, the older having terra rossa soils, and the younger slightly leached shell sand ". There is also a small area of fine-textured soil or basalt.

Table I indicates the distribution of all properties on the Island by seven soil groupings (classified geomorphically except for the complex category). Figure 1 summarises the locational relationships.

TABLE 1.

Property Distribution by Soil Group.

Major Soil Grouping.	*% total properties*		*% total Island area*
	Private	*Bank*	
Mountains	0.5	....	9.2
Foothills	12.5	11.1	29.1
East & South Coastal Plain	20.8	15.3	47.2
West Coastal Plain	10.6	....	4.5
Calcareous Dunes	15.7	....	9.4
Basalt flows	3.2	....	0.6
Complex grouping	8.8	1.9	....
Total	71.6	28.3	100

Private properties are inflated by the inclusion of undeveloped and/or ungrazed blocks; 46% of the 114 properties currently grazed are privately owned, 54% have been developed under the War Service Land Settlement Scheme. Clearly there is no simple relationship between the location of properties and the already dominant soil groups. The concentration of Bank properties on the east and south coastal plain historically reflects the avoidance of these associations because of the dune-lagoon complex and yacca scrub, together necessitating considerable expense in clearing and draining. Earlier private settlement was attracted to a greater variety of soil types, in particular the Bootjack and Wingaroo (east and south coastal plain), Ranga (calcareous dunes), Quoin and Emita (Foothills) associations; the west coast and central foothills associations were favoured by proximity to the Whitemark port facilities during the first two phases of settlement and associated rough-grazing. As already indicated, the potential of the south-east (for example, the Bootjack association north of the port-township of Lady Barron) was recognised in speculation as early as 1911. The data of Table 1 are retabulated below to differentiate types of farming and alienated but ungrazed properties in each major soil group.

(i) The steep granitic outcrops and skeletal soils of the Carena (mountain) association, mainly in the southwest and central south of the Island, support only stunted vegetation and provide a Scenic Reserve and water catchments.

(ii) The five foothills associations are located mainly in the northwest and centre of the Island; there is a range in soil characteristics with residual podzolic and skeletal soils—some highly leached, loose rock debris, prominent hardpans (Quoin),

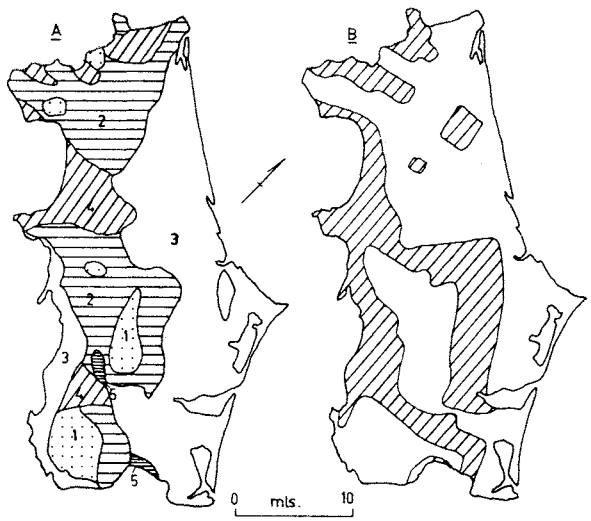

FIGURE 1.

MAP A.—Main soil groupings (Geomorphic units) after Dimmock; 1.—Mountains. 2.—Foothills. 3.—Coastal plains. 4.—Calcareous dunes. 5.—Basalt Flows.

MAP B.—Main cattle and sheep grazing area is shaded; the remainder is undergoing little or no pastoral utilisation at present.

TABLE 2.

Land Utilisation by Soil Group (% Total Properties).

Major Soil Grouping	*Dairy*	*Beef*	*Sheep*	*Mixed: Dairy, Beef, and/ or Sheep.*	*Devd. not grazed.*	*Alienated not developed.*
Mountains	....	....	....	....	....	0.5
Foothills	0.9	1.9	9.7	4.1	4.6	2.3
E. & S. Coast	1.9	1.9	15.3	5.6	6.5	4.6
W. Coast	1.9	....	1.9	3.7	0.9	2.3
Calcareous dunes	0.5	1.9	1.9	8.8	3.2	0.5
Basalt Flows	....	....	0.5	1.8	....	....
Complex grouping	....	0.5	3.2	3.3	1.9	1.4
% Total	5.2	6.2	32.5	27.3	17.1	11.6

"melon-holey" micro-relief (Metta), and in the Liapota association there is deep sand with a well developed organic B horizon; vegetation is mainly sclerophyllous with peppermints (*E. tenuiramis*), bluegum (*E. globulus*), Sheoaks (*Casuarina distyla*), and yacca (*Xanthorrhoea australis*). Sheep grazing is particularly important with Agricultural Bank development of properties on Metta, Emita, and to a less extent the Quoin Associations; acidity, stoniness, restricted drainage, and low fertility are problems.

(iii) Seven associations make up the soils of the east and south coastal plains; teatree (*Leptospermum* and *Melaleuca* spp.), peppermint scrub and yacca predominate; soils include calcareous sands with weak profiles, deep gritty sands with either a well developed organic B horizon or clay subsoil, shell beds, highly organic lagoon soils, and fine-textured soils on alluvial flats; fossil dunes with lagoons limit utilisation of the Lackrana and Nala associations parallel to the east coast. Agricultural Bank development of sheep properties (with beef cattle as a supplementary income source) is concentrated on the Bootjack alluvial flats, the Wingaroo lagoon soils, and the shallow grey soils of the Memana association; Bank "buffer" blocks for agistment are found on the margins of the Nala stabilised dunes along the eastern side of the Furneaux Estate. The Agricultural Bank is currently clearing and carrying out initial development of the north central area of the Island on the undulating Petibela-Memana associations; salinity and inadequate drainage are the main problems here, and superphosphate, copper and zinc are essential for pasture development; on the better drained areas, strawberry clover, Yarloop and Clare subterranean clovers have given outstanding yields (Department of Agriculture, 1962) and emphasise the developmental potential of the area between "Wingaroo" and the northern limit of the Furneaux Estate for further grazing properties. The developed but ungrazed properties (see Table 2) are mainly within the Furneaux Estate, and a majority of the alienated but undeveloped properties are privately owned and situated on the Nala-Lackrana soils of the south east.

(iv) The three west coastal plain associations have developed as acid sands and grits on a marine bench. The main vegetation is teatree, low mixed scrub, with some yacca and sheoaks. Improved pasture is characteristic but increased drainage and trace element additions are necessary on this early-settled coastal strip. Dairying has been attracted both by the terrain and the location of the butter factory south of Whitemark.

(v) The Lughrata and Ranga associations (calcareous dunes), primarily in the north west and south west, include sands with little profile differentiation, and shallow brown to red-brown soils on limestone; the main surviving natural vegetation is teatree, and boobyalla (*Myoporum insulare*). Akalinity and erosion-potential minimise grazing on the Lughrata soils, while the free draining neutral Ranga soils have been extensively sown to improved pasture, with both sheep and beef cattle grazing; pasture and trace element trials continue to benefit production.

(vi) Improved pasture covers virtually all the three square miles of the Thule (Basalt flow) fine textured dark clay loam; gilgai microrelief and stoniness are minimal in limiting grazing or cultivation. The proximity to Whitemark and Lady Barron of the three main areas of this association favoured early clearing of the swamp teatree and the introduction of exotic pasture species for a variety of dairy-sheep-beef property combinations.

Taking account of the present extent of grazing properties, and obvious limits to further expansion (such as the Mountain associations and dune-lagoon complexes), land development can continue in two ways: (1) The area of Petibela-Memana-Nala soils north of the Furneaux Estate could be developed with the degree of capitalisation provided in current Agricultural Bank development; there has been no policy decision however as to whether the government should expand its Flinders Island project, and in fact, the future of the semi-developed (unoccupied) northern portion of the Furneaux Estate is in doubt. (2) Smaller areas with a variety of soil types, occur in a number of localities but of an acreage only attractive to settlers wishing to add to established properties; these could be privately developed but would not significantly increase the grazed acreage nor achieve a majority of private over Bank properties.

CONCLUSION AND ECONOMIC POSTSCRIPT

There is no doubt that granted a sufficient demand for grazing properties, the availability of finance for land development, and the provision of adequate transport and/or abattoir facilities to cater for a markedly increased turnoff, a further 12,000 to 15,000 acres could be developed on Flinders Island; a similar acreage, mainly on Quoin soils, could be developed on nearby Cape Barren Island, though the transport problem would be heightened here by the inadequate port facilities and absence of access roads.

The qualifying statements introduced in the above paragraph are, however, the critical factors. The physical capability of the soils on the Island is established, given highly capitalised drainage, clearing and long-term nutrient development. A majority of the physical problems of land development have been overcome, as discussed elsewhere (Pryor, 1967). The important questions now are: Would cost-benefit analysis validate the development of this geographically isolated area as compared with more accessible Tasmanian or mainland locations? Recognising that expanded production must be directed to Victoria rather than to the already saturated Tasmanian market, would the provision of adequate marketing facilities, shipping, better port handling and possibly an abattoir, guarantee the Island's integration into the Australian economy? (The Bureau of Agriculture in 1961 recommended the erection of an abattoir, while recognising that "as an isolated investment it will be uneconomic".) Finally, what measures can be adopted to ensure continued viability if economic and other pressures were to extinguish land development or transport subsidies? The physical questions have been answered, but the economic questions remain.

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APPENDIX I

SOIL ASSOCIATIONS AND LAND USE, FLINDERS ISLAND

Geomorphic Unit	*Soil Association*	*General description of* (i) geomorphology (ii) soils	*General landuse or landcover*	*General location*	*Area sq. mls.*
Mountains ..	Carena	(i) Granite, steep slopes, elevations to 2,500 ft. (ii) Mainly bare, a few skeletal soils	Scenic reserve, water catchments stunted vegetation	SW, centre, and scattered patches	47
Foothills ..	Lenna	(i) Quartzite and slate to 1,500 ft., some steep (ii) Residual podzolic and skeletal soils, loose rock debris	Limited pasture; catchments, timber (sclerophyllous)	Central W, sth. coast	27
	Quoin	(i) Granite, mature dissection (ii) Strongly weathered, highly leached, some prominent hardpans	NW little used; centre Ag. Bank impr. pasture	NW, centre SW	73
	Metta	(i) Granite and quartzite margins, valley floors of Quoin and Lenna hill soils (ii) "melon-holey" micro-relief	Ag. Bank impr. pasture	Centre, mt. margins	18
	Emita	(i) Granite hills, tors common (ii) Podzolic, high % relatively unweathered primary minerals (cf. Quoin)	Emita impr. pasture; yacca, timber	Emita, central W	23
	Liapota	(i) Sand over granite to 600 ft. (ii) Deep sand, well developed organic B horiz.	Reverted bracken	NE, NW	8
Coastal Plains: (*a*) East ..	Lackrana	(i) Beach ridges, fossil dunes with lagoons (ii) Slightly calcareous sands, weak profiles	Dunes, low scrub	All E coast, Whitemark	31
	Nala	(i) Stabilised dunes, lagoons; to 20 ft. (ii) Deep gritty sands, well dev. organic B horiz.	Dense scrub, margins impr. pasture	E inland belt	98
	Petibela	(i) Undulating sand rises and alluvium strips, 15 to 100 ft. (ii) Gritty sands with clay subsoils	Yacca scrub; Ag. Bank clearing and some impr. pasture	N central	29
	Memana	(i) Broad flats, formerly coastal lagoons, 25-80 ft. (ii) Shallow grey soils over hard calcareous horiz. of secondary carbonate with some shells	Yacca scrub; Ag. Bank clearing, limited impr. pasture to date	N central	29
	Wingaroo	(i) Do. Memana; younger, sea level to 20 ft. (ii) Highly organic lagoon soils over loose sand and shell beds	Impr. pasture; Ag. Bank on S central after drainage	S central, NE	24
	Bootjack	(i) Broad alluvial flats, low sandy rises, gentle fall to coast, 100 to c.20 ft. (ii) Fine textured soils on flats, sandy soils on subordinate low rises	Impr. pasture; Ag. Bank on centre	Sth., Centre	20

APPENDIX I—*contd.*

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Coastal plains: East—*contd.*	Altmoor	(i) E-W sand dunes on a plain of Stratified unconsolidated marine sediments, 100-200 ft. (ii) Siliceous sands with organic B horizon rises, very variable soils in troughs	Impr. pasture except on shallow sand	Central Sth.	11
(*b*) West ..	Whitemark	(i) Marine bench av. 15 ft. above s.l. (ii) Deep sands and grits, shallow grey soils over limestone or clay	Impr. pasture	SW inland belt	10
	Loccota	(i) Continues marine bench (Whitemark), flat granite and quartzite colluvium, some dunes (ii) Various angular grits and other soils on granite detritus	Impr. and rough pasture	SW coast	7
	Blue Rocks	(i) Do. Loccota; remnant of higher and older bench, at c.30 ft. (ii) Various soils, incl. deep sands, sandy shingle, and soils of Ranga Assocn.	Most in pasture, some impr.	Central W coast	6
Calcareous Dunes	Lughrata	(i) Younger series; hairpin dunes of shell sand adjacent to coast; some sand blows over granite hills (ii) V. calcareous sands, little profile differentiation except organic matter	Minimal natural pasture; shrubs (eg. manuka) and reeds	NW and SW coasts	13
	Ranga	(i) Older series; longitudinal ridges on granite and quartzite to 500 ft.; dune limestone, sink-holes and caves (ii) Shallow brown to red-brown soils on limestone	Impr. pasture extensive	2 areas W inland	36
Basalt Flows:	Thule	(i) Small plateau at 400 ft.; small, widely scattered lower outcrops (ii) Fine textured dark clay loam	Impr. pasture extensive	Sth. coast, Thule	3
Laterite ..	..	9 small occurrences (not mapped separately by Dimmock); composed of pisolitic mat. or ferruginous sandstones or grits	..	widely scattered	..
A	A	B	C		A

Sources: A —Dimmock, G. M., *op.cit., passim.*
B —Dimmock and Field work.
C —Field work.